WE CLAIM:

1.   A computer assisted, non-radiological method of intra-operatively measuring and assessing relative geometric relationships among skeletal features of a hip joint, suitable for surgical navigation of a hip arthroplasty operation, comprising the steps of:

defining a pelvic plane from at least three recognizable anatomic features of the pelvis;

tracking with a locating system the orientation of an acetabular implant, to obtain acetabular implant orientation data; and

adjusting said acetabular implant into a desired orientation with respect to said defined pelvic plane, without reference to previously obtained radiological data, by relating said acetabular implant orientation data to said defined pelvic plane.

2.   The method of claim 1, wherein said step of defining a pelvic plane comprises touching, with a trackable probe, superficial points corresponding to said anatomic pelvic features, and tracking said probe with said locating system.

3.   The method of claim 2 wherein said anatomical pelvic features comprise at least three of an ipsilateral anterior superior iliac spine, a contralateral anterior superior iliac spine, an ipsilateral pubic tubercle, and a contralateral pubic tubercle.

4. The method of claim 2 further comprising the steps of:

fixing a trackable marker on the pelvic bone,

defining a pelvic marker reference system, associated with said pelvic marker; determining a relationship between said pelvic marker reference system and said pelvic plane,

tracking said pelvic plane by (a) tracking said reference marker with said locating system, and (b) applying a transformation to compensate for the determined relationship between said reference marker and said pelvic plane.

5. A method of determining changes between pre-operative and post-operative relationships between a femur and a pelvis, suitable for use during a hip arthroplasty operation, comprising the steps of:

maneuvering the femur into a reference position;

measuring, with a non-radiological locating system, pre-replacement femoral parameters in relation to the pelvis;

after implanting a prosthetic, returning the femur to the reference position;

again measuring, with a non-radiological locating system, post-replacement femoral parameters in relation to the pelvis; and

comparing said pre-replacement and said post-replacement parameters in a computer model.

6. The method of claim 5, wherein said acts of measuring and again measuring the femoral parameters are performed by fixing an optically trackable marker to the femur without penetrating through the outer cortical shell of the femur.

7. The method of claim 5, including the further step of:

before measuring, attaching an optical tracking marker to the femur by:

positioning a collar over the trochanter, said collar bearing an optical tracking target; and

attaching said collar to the femur by a ligature about the femur, said ligature arranged to pull the collar firmly against the trochanter.

8. A system for measuring and assessing the skeletal geometry of a hip joint during surgery, suitable for surgical navigation of a hip arthroplasty operation, comprising:

an locating system which determines positions and orientations of trackable markers;

a computer, interfaced to said locating system to receive tracking data, and calculating from said tracking data the positions of tracked objects in relation to a generic computer model of a patient's hip geometry;

a software module, executable on said computer, which defines the patient's pelvic plane without reference to previously obtained radiological data, by locating at least three pelvic landmarks; and

a pelvic tracking marker, fixable to the pelvic bone and tracked by said locating system, to track in real time the orientation of said pelvic plane.

9. The system of claim 8, further comprising:

a femoral tracking marker, securely attachable to a femur of the patient by a non-penetrating ligature and trackable by said locating system to detect changes in leg length and femoral offset.

10. The system of claim 9, further comprising a trackable acetabular navigation tool, capable of fixation to an acetabular shell implant;

and wherein said software module calculates the relationship between said navigation tool and a real time orientation of said pelvic plane, and displays said relationship, to facilitate establishing proper geometry of said shell implant during surgery.

11. The system of claim 9, further comprising an trackable, manual probe for acquiring the positions of said pelvic landmarks,

and wherein said software module defines said pelvic plane from at least three and not more than four pelvic landmarks.